Investigating Speed Patterns and Estimating Speed on Traffic-Calmed Streets

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Introduction

Safer Residential Streets

- Speeding on local streets is a major concern.
- Create safer streets to protect road users and improve community livability.
- Employ speed reduction techniques – traffic calming.

Traffic-calmed streets = Lower speeds?

- Previous research agree.
- Are lower speeds maintained throughout the entire length of a street?
- Are the speeds simply lower across and in proximity with a traffic calming device?

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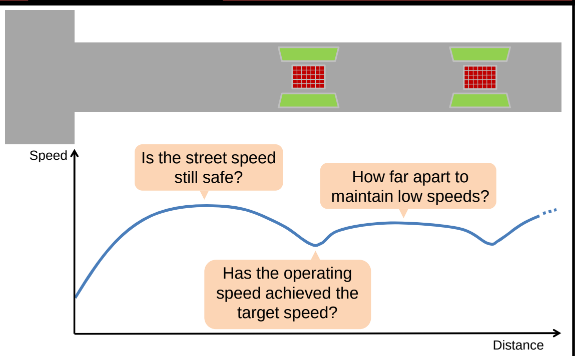
Introduction



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Introduction

Research Objectives

- To determine the speed-reducing effect and the extent of influence zones of vertical and horizontal deflections.
- To examine the effect of traffic calming devices on speed variation.
- To develop methods for the prediction of speed on traffic-calmed streets.

Research Area

17 residential streets in Christchurch, calmed by speed humps, speed tables, angled slow points and mid-block narrowings.

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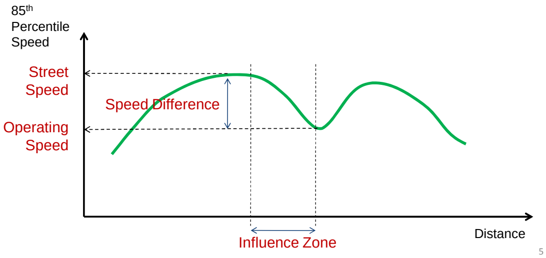
Method

Analysis of Speed Profiles

Speed profiles were plotted to compare speed-reducing effect and to determine influence zone of the different devices.



Method

Testing for Variation In Speed

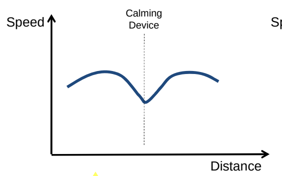
The F-test for equality of variances of speeds at the device and at distances from the device were conducted.

Speed Estimation Methods

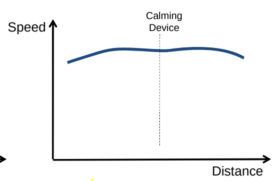
- Speed-distance curves were produced to estimate speed at varying distances from the devices.
- Models for estimating speed midway between speed humps and speed tables were developed using linear regression.

Results

General Speed Patterns



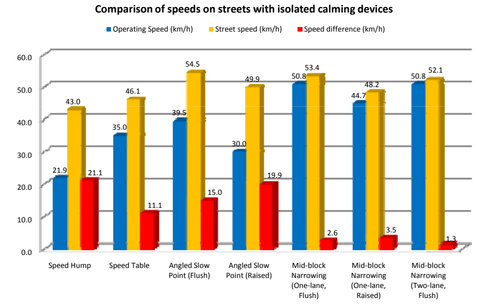
- Speed hump
- Speed table
- Angled slow point



- Mid-block narrowing

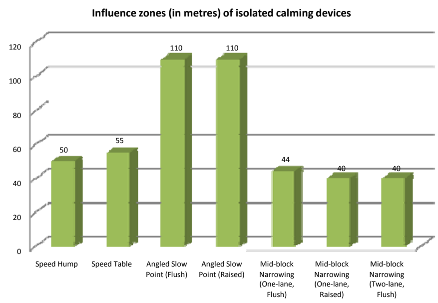
Results

Speed-Reducing Effect



Results

Influence Zones



Results

Variation of Speed at Devices

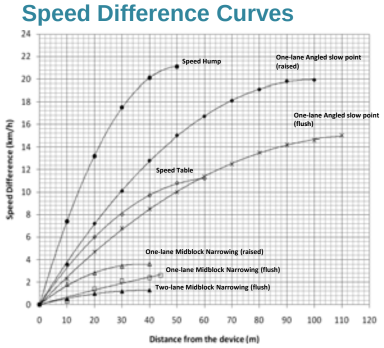
Large deviations from the mean speed when traversing calming devices imply that there is significant behavioural differences among drivers.

Variances in speed were:

- **smaller** across the **speed hump** and the **raised angled slow point** than other sections on the respective streets.
- **larger** across the **speed table** than other sections of the street.
- **similar** throughout streets with the **flush angled slow point** and **mid-block narrowings**.

Results

Speed Difference Curves

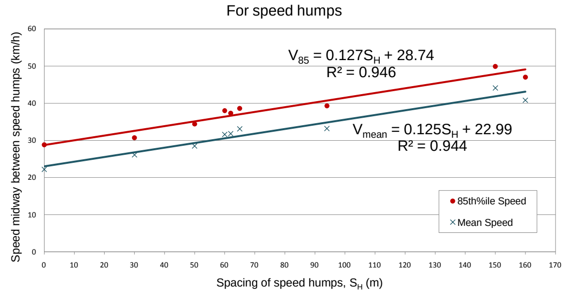


- Speed-distance relationships were approximately quadratic in form.
- Speed difference curves can be used to estimate speed at varying distances from the device if the design speed is known.

Results

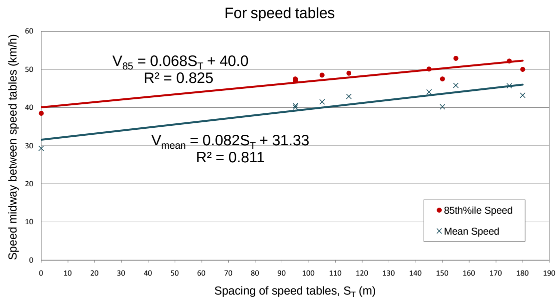
Speed-Spacing Models

For speed humps



Results

Speed-Spacing Models



Results

Speed-Spacing Models

		85th Percentile Speed				Mean Speed				
	Desired max. street speed (km/h)	35	40	45	50	30	35	40	45	50
Spacing (m)	Speed humps	≤ 50	≤ 85	≤ 125	≤ 165	≤ 55	≤ 95	≤ 135	≤ 175	≤ 215
	Speed tables	*	*	≤ 70	≤ 145	*	≤ 45	≤ 105	≤ 165	≤ 225

* Desired maximum street speed not attainable

Conclusions

Are vertical deflections effective?

- The **speed hump** produced the lowest operating speed (21.9 km/h) and largest speed change (-21.1 km/h). Variation of speeds across the speed hump was lower compared to other sections on the street.
- The **speed table** does reduce speed (-11.1 km/h), but operating speed is 15 km/h above the target speed of 20 km/h.

Are horizontal deflections effective?

- **Mid-block narrowings** do not reduce speed significantly.
- **Angled slow points** have a greater speed-reducing effect than mid-block narrowings and the speed table, but street and operating speeds are high.

Conclusions

Appropriate spacing for desired speed

- 85th percentile speed exceeds 50 km/h if spacing of:
  - speed humps is > 170 m
  - speed tables is > 145 m
- The spacing of speed humps is recommended to be ≤ 85 m to achieve a desired maximum 85th percentile of 40 km/h.
- A desired maximum 85th percentile speed of 40 km/h may not be attainable with speed tables, but 45 km/h is possible if spacing of speed tables is ≤ 70 m.

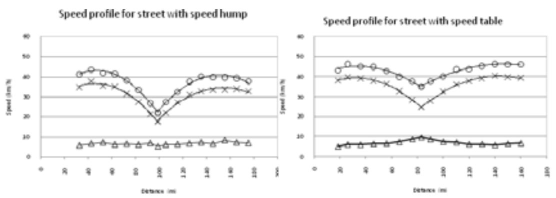
Closing

Achieving Low Speed Environments

- For traffic calming measures to be effective,
  - select devices that produce optimal speed-reducing effect.
  - use multiple devices that are appropriately spaced.
- There is a better chance of achieving low speed environments if a 30 km/h or 40 km/h speed limits is imposed and supported by traffic calming measures.

Appendix

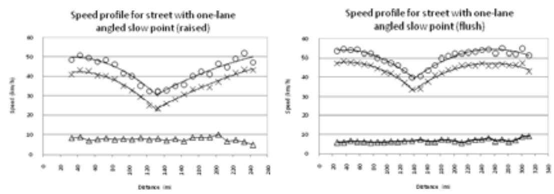
Speed Hump vs Speed Table



- Street speed - LOWER
- Operating speed - LOWER
- Speed difference - BIGGER

Appendix

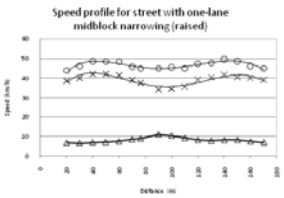
Angled Slow Points: Raised vs Flush

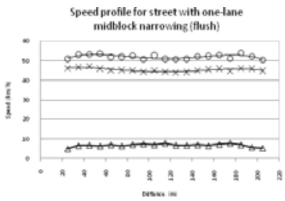


- Street speed - LOWER
- Operating speed - LOWER
- Speed difference - BIGGER

Appendix

Mid-block narrowings: Raised vs Flush

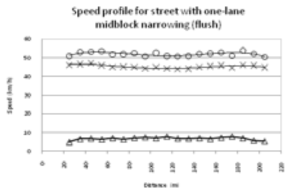


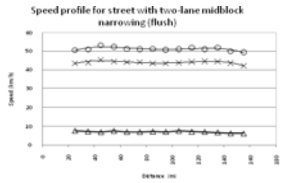


- Street speed - LOWER
- Operating speed - LOWER
- Speed difference – SLIGHTLY BIGGER

Appendix

Mid-block narrowings: One-Lane vs Two-Lane





- Slightly lower speeds